

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Original Patent Claim) A method of discriminating toner bottle types, comprising:
the object sensing step of rotating a toner bottle, sensing an object to be sensed
formed on an outer surface of said toner bottle and, if said object is not sensed, outputting
information indicating abnormality; and
the ratio discrimination step of checking, if said object is sensed, whether said object
is formed at a predetermined ratio on the outer surface of said toner bottle, outputting
information indicating abnormality if said object is not formed at the predetermined ratio, and
outputting information indicating normality if said object is formed at the predetermined
ratio.

2. (Original Patent Claim) A method according to claim 1, wherein the object ratio
discrimination step comprises the steps of:

detecting a first time interval from the timing at which said sensor senses one end
portion of said object of said toner bottle in rotation to the timing at which said sensor senses
the other end portion;

detecting a second time interval from the timing at which said sensor senses the other
end portion of said object to the timing at which said sensor senses the one end portion; and
checking whether said object is formed over a predetermined length on the outer
surface of said toner bottle by using the first and second time intervals.

3. (Original Patent Claim) A method according to claim 1, wherein the object ratio
discrimination step is performed with reference to the timing at which a first end portion of
said object of said toner bottle in rotation is sensed and the timing at which a second end
portion of said object is sensed.

4. (Original Patent Claim) An apparatus for discriminating toner bottle types,
comprising:

a motor for rotating a toner bottle;

a motor driver for driving said motor;

a sensor for sensing an object to be sensed formed in a predetermined portion of said toner bottle and outputting a sensor signal; and

a CPU for controlling said motor driver and discriminating said toner bottle by using the sensor signal,

wherein said CPU rotates said toner bottle by controlling said motor driver, senses said object assumed to be formed on an outer surface of said toner bottle by using said sensor, outputs information indicating abnormality if said object is not sensed,

checks, if said object is sensed, whether said object is formed at a predetermined ratio on the outer surface of said toner bottle, outputs information indicating abnormality if said object is not formed at the predetermined ratio, and outputs information indicating normality if said object is formed at the predetermined ratio.

5. (Original Patent Claim) An apparatus according to claim 4, wherein in order to check whether said object is formed at the predetermined ratio on the outer surface of said toner bottle,

said CPU detects a first time interval from the timing at which said sensor senses one end portion of said object of said toner bottle in rotation to the timing at which said sensor senses the other end portion,

detects a second time interval from the timing at which said sensor senses the other end portion of said object to the timing at which said sensor senses the one end portion, and

checks whether said object is formed at the predetermined ratio on the outer surface of said toner bottle by using the first and second time intervals.

6. (Original Patent Claim) A toner bottle adapted to fit an apparatus for discriminating toner bottle types, wherein

said toner bottle type discriminating apparatus comprises:

a motor for rotating a toner bottle;

a motor driver for driving said motor;

a sensor for sensing an object to be sensed formed in a predetermined portion of said toner bottle and outputting a sensor signal; and

a CPU for controlling said motor driver and discriminating said toner bottle by using the sensor signal, and

said CPU rotates said toner bottle by controlling said motor driver, senses said object assumed to be formed on an outer surface of said toner bottle by using said sensor, outputs information indicating abnormality if said object is not sensed,

checks, if said object is sensed, whether said object is formed at a predetermined ratio on the outer surface of said toner bottle, outputs information indicating abnormality if said object is not formed at the predetermined ratio, and outputs information indicating normality if said object is formed at the predetermined ratio.

7. (Original Patent Claim) A toner bottle according to claim 6, wherein in order to check whether said object is formed at the predetermined ratio on the outer surface of said toner bottle,

said CPU detects a first time interval from the timing at which said sensor senses one end portion of said object of said toner bottle in rotation to the timing at which said sensor senses the other end portion,

detects a second time interval from the timing at which said sensor senses the other end portion of said object to the timing at which said sensor senses the one end portion, and

checks whether said object is formed at the predetermined ratio on the outer surface of said toner bottle by using the first and second time intervals.

8. (Original Patent Claim) A method of stirring toner and discriminating toner bottle types, comprising the steps of:

rotating a toner bottle through a predetermined angle in a forward direction, sensing an object to be sensed assumed to be formed on an outer surface of said toner bottle and, if said object is not sensed, outputting information indicating abnormality; and

rotating said toner bottle through a predetermined angle in a reverse direction, sensing said object by using said sensor and, if said object is not sensed, outputting information indicating abnormality,

wherein toner is stirred by rotating said toner bottle through the predetermined angles in the forward and reverse directions.

9. (Original Patent Claim) An apparatus for stirring toner and discriminating toner bottle types, comprising:

a motor for rotating a toner bottle;

a motor driver for driving said motor;

a sensor for sensing an object to be sensed formed in a predetermined portion of said toner bottle and outputting a sensor signal; and

a CPU for controlling said motor driver and receiving the sensor signal,

wherein said CPU controls said motor driver to rotate said toner bottle through a predetermined angle in a forward direction, senses said object assumed to be formed on an outer surface of said toner bottle by using said sensor, outputs information indicating abnormality if said object is not sensed,

rotates said toner bottle through a predetermined angle in a reverse direction, senses said object by using said sensor, and outputs information indicating abnormality if said object is not sensed.

10. (Original Patent Claim) A toner bottle adapted to fit an apparatus for stirring toner and discriminating toner bottle types, wherein

said toner stirring and toner bottle type discriminating apparatus comprises:

a motor for rotating a toner bottle;

a motor driver for driving said motor;

a sensor for sensing an object to be sensed formed in a predetermined portion of said toner bottle and outputting a sensor signal; and

a CPU for controlling said motor driver and receiving the sensor signal, and

said CPU controls said motor driver to rotate said toner bottle through a predetermined angle in a forward direction, senses said object assumed to be formed on an outer surface of said toner bottle by using said sensor, outputs information indicating abnormality if said object is not sensed,

rotates said toner bottle through a predetermined angle in a reverse direction, senses said object by using said sensor, and outputs information indicating abnormality if said object is not sensed.

Claims 11-13 (Canceled)

14. (Currently Amended) A toner bottle for use with an image forming apparatus to supply toner to the image forming apparatus when the toner bottle is rotated by the image forming apparatus, the image forming apparatus having a sensor that senses the toner bottle,

comprising:

an elongated cylindrical bottle body that houses toner, the bottle body having an edge portion and an end portion, the end portion being positioned opposite to the edge portion in an axial direction along the bottle body, and a groove extending around the outer surface of the bottle body and extending between adjacent the edge portion and adjacent the end portion;

a toner discharge port provided on the bottle body adjacent the edge portion, the toner being discharged from the discharge port when the toner moves toward the edge portion during toner bottle rotation; and

a rib having a predetermined length, the rib being provided on the outer surface of the bottle body adjacent the end portion, the rib adapted to be sensed by the sensor in the image forming apparatus during toner bottle rotation in order to judge whether the rib exists at a predetermined position and extends for a predetermined ratio on the outer surface of the bottle body, to thereby discriminate toner bottle type.

15. (Previously Presented) The toner bottle according to claim 14, wherein the rib extends in a circumferential direction along the outer surface of the bottle body.

16. (Previously Presented) The toner bottle of claim 15, wherein the rib is formed at a predetermined position on the bottle body relative to the toner discharge port, the rib being aligned with the toner discharge port in an axial direction along the bottle body.

17. (Previously Presented) The toner bottle according to claim 14, wherein the rib faces the sensor in the image forming apparatus during rotation of the toner bottle.

18. (Previously Presented) An image forming apparatus in combination with the toner bottle according to claim 14, the image forming apparatus comprising:

a motor for rotating the toner bottle;

a motor driver for driving the motor;

a sensor for sensing the rib of the toner bottle and outputting a sensor signal; and

a CPU that controls the motor driver and discriminates the toner bottle using the sensor signal,

wherein the CPU rotates the toner bottle by controlling the motor driver, senses the rib

using the sensor, outputs information indicating abnormality if the rib is not sensed by the sensor,

checks, if the rib is sensed, whether the rib has the predetermined ratio on the outer surface of the bottle body, outputs information indicating abnormality if the rib does not extend for the predetermined ratio, and outputs information indicating normality if the rib extends for the predetermined ratio.

19. (Previously Presented) The image forming apparatus in combination with the toner bottle according to claim 18,

wherein in order to check whether the rib extends for the predetermined ratio on the outer surface of the bottle body,

the CPU detects a first time interval that is based on when the sensor senses a first rib end portion of the rib during toner bottle rotation to when the sensor senses a second rib end portion,

detects a second time interval that is based on when the sensor senses the second rib end portion of the rib during toner bottle rotation to when the sensor senses the first rib end portion, and

checks whether the rib extends for the predetermined ratio on the outer surface of the bottle body based on the first and second time intervals.

20. (Previously Presented) The image forming apparatus in combination with the toner bottle according to claim 18, wherein the CPU controls the motor driver to stop rotation of the toner bottle when the sensor finishes sensing the rib.

21. (Currently Amended) A toner bottle for use in an image forming apparatus having a toner bottle sensor, the toner bottle comprising:

an elongated cylindrical body portion having an outer surface;

at least one groove extending around the outer surface of the cylindrical body portion;

a first end portion at a first end of the cylindrical body portion;

a second end portion at a second end of the cylindrical body portion opposite the first end portion in an axial direction along the cylindrical body portion;

a toner discharge port positioned at the first end portion on an outer circumferential surface of the toner bottle; and

a rib formed at the second end portion at a predetermined position relative to the toner discharge port and aligned with the toner discharge portion in an axial direction along the cylindrical body portion, the rib being configured for use to be sensed by the toner bottle sensor of the image forming apparatus to discriminate toner bottle type.

Claims 22-26 (Canceled)

27. (Currently Amended) The toner bottle of claim 21, wherein the first end portion has a diameter smaller than a diameter of the cylindrical body portion,
wherein the rib extends circumferentially for a predetermined angle relative to the outer surface of the cylindrical body portion, and
wherein the first end portion, with the toner discharge port, is positioned axially outside the groove.

28. (Previously Presented) The toner bottle of claim 27, wherein the predetermined angle is less than 90 degrees.

Claim 29 (Canceled)

30. (Currently Amended) The toner bottle of claim 27, wherein the groove is a spiral groove that extends continuously without breaks from adjacent the second end portion to adjacent the first end portion.

Claim 31 (Canceled)

32. (Currently Amended) The toner bottle of claim 30, wherein the continuous spiral groove comprises a plurality of groove portions that extend parallel to one another in a direction circumferentially along the outer surface of the cylindrical body portion, the plurality of groove portions comprising a first groove portion, a second groove portion, and a third groove portion, wherein a first distance between the first groove portion and the second groove portion is equal to a second distance between the second groove portion and the third groove portion.

33. (Currently Amended) The toner bottle of claim 27, wherein the first end portion is configured to engage with a rotatable holder guide in the image forming apparatus.

34. (Previously Presented) An image forming apparatus in combination with a toner bottle according to claim 21.

35. (Currently Amended) A method of discriminating toner bottle types, comprising the steps of:

providing a toner bottle, the toner bottle comprising:
an elongated cylindrical body portion having an outer surface,
at least one groove extending around the outer surface of the cylindrical body portion,
a first end portion at a first end of the cylindrical body portion,
a second end portion at a second end of the cylindrical body portion opposite the first end portion in an axial direction along the cylindrical body portion,
a toner discharge port positioned at the first end portion, and
a rib formed at the second end portion on an outer surface of the toner bottle;
rotating the toner bottle in an image forming apparatus;
sensing, using a sensor in the image forming apparatus, the rib while rotating the toner bottle and, if the rib is not sensed, outputting information indicating abnormality; and
discriminating toner bottle type by checking, if the rib is sensed, whether the rib extends for a predetermined ratio on the outer surface of the toner bottle, outputting information indicating abnormality if the rib does not extend for the predetermined ratio, and outputting information indicating normality if the rib extends for predetermined ratio.

Claim 36 (Canceled)

37. (Currently Amended) The method of claim 35, wherein the step of discriminating toner bottle type comprises:

detecting, during the step of rotating the toner bottle, a first time interval that is based on when the sensor senses a first rib end portion of the rib to when the sensor senses a second rib end portion,

detecting, during the step of rotating the toner bottle, a second time interval that is

based on when the sensor senses the second rib end portion of the rib to when the sensor senses the first rib end portion, and

checking whether the rib extends for the predetermined ratio on the outer surface of the toner bottle based on the first and second time intervals.

38. (Currently Amended) The method of claim 35, wherein the rib is positioned at a predetermined position on the toner bottle relative to the toner discharge port, and the rib is axially aligned with the toner discharge port in a direction along the cylindrical body portion.

39. (Currently Amended) The method of claim 35, wherein the rib extends circumferentially for a predetermined angle relative to the outer surface of the cylindrical body portion.

40. (Currently Amended) An image forming apparatus toner bottle, comprising:
an elongated cylindrical body portion having an outer surface;
a first end portion at a first end of the body portion;
a second end portion at a second end of the cylindrical body portion opposite the first end portion in an axial direction along the body portion;
a toner discharge port on an outer circumferential surface of the toner bottle positioned at the first end portion;
a groove comprising a spiral groove extending continuously without breaks around the outer surface of the body portion from adjacent the second end portion to adjacent the first end portion; and
a rib formed adjacent the second end portion at a predetermined position axially aligned with the toner discharge port along the body portion, the rib extending circumferentially along the outer surface of the body portion for a predetermined angle relative to the outer surface of the body portion.

Claim 41 (Canceled)

42. (Currently Amended) The image forming apparatus toner bottle of claim 40, wherein the spiral groove comprises a plurality of groove portions that extend parallel to one another in a direction circumferentially along the outer surface of the cylindrical body

portion, the plurality of groove portions comprising a first groove portion, a second groove portion, and a third groove portion, wherein a first distance between the first groove portion and the second groove portion is equal to a second distance between the second groove portion and the third groove portion.

43. (Currently Amended) The image forming apparatus toner bottle of claim 40, wherein the rib is capable of being used to discriminate toner bottle type,

wherein the first end portion has a diameter smaller than a diameter of the cylindrical body portion,

wherein the first end portion, with the toner discharge port, is positioned axially outside the groove.

Claim 44 (Canceled)

45. (Previously Presented) The toner bottle of claim 6, wherein the toner bottle further comprises:

an elongated cylindrical body portion having an outer surface;

at least one groove extending around the outer surface of the cylindrical body portion;

a first end portion at a first end of the cylindrical body portion;

a second end portion at a second end of the cylindrical body portion opposite the first end portion in an axial direction along the cylindrical body portion; and

a toner discharge port positioned at the first end portion,

wherein the object is formed at the second end portion.

46. (Previously Presented) The toner bottle of claim 45, wherein the object is a rib.

47. (Previously Presented) The toner bottle of claim 46, wherein the rib is formed at a predetermined position on the toner bottle relative to the toner discharge port.

48. (Previously Presented) The toner bottle of claim 47, wherein the toner discharge port is aligned with the rib in an axial direction along the cylindrical body portion.

49. (Previously Presented) The toner bottle of claim 48, wherein the first end portion has a diameter smaller than a diameter of the cylindrical body portion.

50. (Previously Presented) The toner bottle of claim 46, wherein the groove is a spiral groove that extends from adjacent the second end portion to adjacent the first end portion.

51. (Previously Presented) The toner bottle of claim 50, wherein the spiral groove extends continuously without breaks from adjacent the second end portion to adjacent the first end portion.

52. (Previously Presented) The toner bottle of claim 51, wherein the continuous spiral groove comprises a plurality of groove portions that extend parallel to one another in a direction circumferentially along the outer surface of the cylindrical body portion.

53. (Previously Presented) The toner bottle of claim 52, wherein the plurality of groove portions comprises a first groove portion, a second groove portion, and a third groove portion, wherein a first distance between the first groove portion and the second groove portion is equal to a second distance between the second groove portion and the third groove portion.

54. (Previously Presented) The toner bottle of claim 53, wherein the toner discharge port is positioned on an outer circumferential surface of the first end portion.